



National Aeronautics and  
Space Administration  
  
Lyndon B. Johnson Space  
Center

**NIST**  
National Institute of  
Standards and Technology  
Technology Administration  
U.S. Department of Commerce

## FINAL AGENDA

# 2<sup>nd</sup> Joint Workshop on Measurement Issues in Single Wall Carbon Nanotubes: Purity and Dispersion Part II

January 26-28, 2005  
NIST, Gaithersburg, MD  
Green Auditorium

### Wednesday, January 26th

7:30 am

#### REGISTRATION AND CONTINENTAL BREAKFAST

8:00	Welcome	Hratch Semerjian Acting Director, NIST
	Welcome/Workshop Background	Phillip J. Bond Under Secretary for Technology/DOC
8:30	"Measurement Uniformity: Why Standardization Is Critical for Nanotechnology"	Stephanie Hooker NIST

#### SESSION ONE – Plenary Talks

**Session Chair: Sivaram Arepalli, NASA-JSC**

9:00	"Carbon Fullerenes and Nanotubes: Challenges to (Nano)Materials Science"	Robert Haddon UC-Riverside
9:40	"The Nanomaterials Business: Not Just Manufacturing"	James Von Ehr II Zyvex Corp.
10:20	<b>BREAK</b>	

#### SESSION TWO – Purity Characterization – Existing Protocols

**Session Chair: Leonard Yowell, NASA-JSC**

10:40	"Characterization of Length, Diameter and Metal Content of HiPco Tubes"	Kirk Ziegler Rice University
11:05	"Protocol for Quality Control of Bulk Single Wall Carbon Nanotube Materials"	Ursula Detlaff Max-Planck-Institute

11:30	“Raman Spectroscopy and Thermogravimetric Analysis of Sonicated SWCNTs with Artificial Defects”	Young Hee Lee Sungkyunkwan Univ.
11:55	“Understanding the Effects of Sonication and Homogenization on Nanotubes in Oils to Optimize Dispersion”	Rick Barrera Rice University
<b>12:20</b>	<b>LUNCH</b>	

## **SESSION TWO – Protocols (Continued)**

**Session Chair: Robert Haddon, University of California at Riverside**

1:30	“Reference Standard for Carbonaceous Impurity Measurements in Carbon Nanotubes”	Pasha Nikolaev NASA-JSC
1:55	“The Carbon Nanotube Supply Chain from the Customer’s Perspective”	Mark Banash Zyvex

## **SESSION THREE – Purity Characterization – New Techniques**

**Session Chair: Pasha Nikolaev, NASA-JSC**

2:20	“Purity Evaluation of Single-Walled Carbon Nanotubes by Use of Near-Infrared Spectroscopy”	Mikhail Itkis UC-Riverside
2:45	“Using TGA for Quick Evaluation of Small Diameter Few-Walled Carbon Nanotubes”	Jie Liu Duke University
3:10	“Spectral Responsivity of Pyroelectric Detectors Coated with Carbon Nanotubes”	John Lehman NIST

**3:35 BREAK**

**4:00 BREAKOUT SESSIONS – Purity analysis (Sivaram Arepalli, Pasha Nikolaev, Richard Cavanagh)**

5:30	Adjourn
7:00	Reception (hotel)
7:30	Poster Session (hotel)

**Thursday, January 27th**

**7:30am                      REGISTRATION AND CONTINENTAL BREAKFAST**

7:55	Welcome & logistics for Day 2	Stephanie Hooker Sivaram Arepalli
8:00	“Nanomaterial Standards for NASA Applications”	Leonard Yowell NASA-JSC

**SESSION FOUR – Novel Separation and Dispersion Metrology**

**Session Chair: Erik Hobbie, NIST, Gaithersburg, MD**

8:30	“Purification and Separation of DNA-wrapped Nanotubes by Liquid Chromatography”	Ming Zheng DuPont
8:55	“Small Angle Scattering Measurements of Nanotube Dispersion”	Barry Bauer NIST
9:20	“Single-Wall Carbon Nanotube Dispersions: Gels, Liquid Crystalline Phases, Optical and Magnetic Anisotropies”	Mohammad Islam Univ. of Pennsylvania
9:45	“Small Diameter Carbon Nanotube Product Forms: Implications for Dispersion	Jeff Bahr Carbon Nanotechnologies
10:10	“Dispersion and Separation of Carbon Nanotubes to Enable Precision Nanometrology at NIST”	Kalman Migler NIST
<b>10:25</b>	<b>BREAK</b>	

**SESSION FIVE –Dispersion Quality – Composite Applications**

**Session Chair: Cheol Park, NIA/NASA-LaRC**

10:45	“Characterization of Carbon Nanotube Polymer Composites”	Peter Lillehei NASA-LaRC
11:05	“Quantification of Dispersion and Purity of SWNT Prepared by Catalytic Method CoMoCAT”	Daniel Resasco SouthWest Nanotechnologies
11:30	“A New Type of Carbon Nanotube Yarn for Artificial Muscle and Other Multifunctional Material Applications”	Ray Baughman Univ. of Texas at Dallas
<b>11:55</b>	<b>LUNCH</b>	

## SESSION SIX – Isolated Tube Characterization

**Session Chair: Stephanie Hooker, NIST, Boulder, CO**

1:15	“Characterization and Commercialization of Carbon Nanotubes”	Daniel Gamota Motorola
1:40	“Tunable Resonance Raman Measurements of Suspended Single Wall Carbon Nanotubes”	Anna Swan Boston University
2:05	“Raman Imaging and Fluorescence Studies of Single Isolated Carbon Nanotubes”	Steve Doorn Los Alamos National Lab
<b>2:30</b>	<b>BREAK</b>	
<b>3:00</b>	<b>BREAKOUT SESSIONS – Dispersion measurements (Leonard Yowell, Cheol Park, Kalman Migler)</b>	
5:00	Adjourn	
7:00	Dinner in groups (if desired)	

**Friday, January 28th**

**7:30 am** **REGISTRATION AND CONTINENTAL BREAKFAST**

7:55 Welcome & logistics for Day 3 Stephanie/Sivaram

## PANEL DISCUSSION – Reports from Breakout Sessions

**Moderator: Stephen Freiman, NIST**

8:00	Panel 1 - Purity Analysis (co-chairs from each breakout)
<b>9:30</b>	<b>BREAK</b>
10:00	Panel 2 – Dispersion Measurement (co-chairs from each breakout)
11:30	Summary, General Discussion, and Plans for Future
<b>12:30</b>	<b>Adjourn meeting</b>
12:45	Lunch in groups if desired